Bringing Big Builders to Efficiency

For several years, the Consortium for Advanced Residential Buildings (CARB)—one of the five U.S. Department of Energy Building America teams—has been producing cost-effective, energy-saving prototype homes, with the goal of convincing builders to bring these technologies into the marketplace. To help builders do this, CARB has developed two nearly zero-cost packages, for hot and cold climates respectively, that significantly cut home energy bills.

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Workers at a Detroit-area building site install a structural insulated panel roof on a low-cost, energy-efficient home, built as part of the Building America program.

The key element in the package is a glazing upgrade to low-e, solar control glass. Though the window upgrade costs money, it allows the air conditioning equipment to be downsized, which in most cases approximately balances the budget. Add in a few value-engineered construction savings such as resized headers, and the package comes out to be zero-cost.

Up north, where air conditioning is an option, downsizing the furnace doesn't save as much money as downsizing the air conditioning would save. Here, CARB turns to the other advantage of high-performance glass: improved comfort. By cutting the radiant loss from people to the glass surface, the better glazing obviates the need to locate warm-air supply registers directly below the windows in order to maintain comfort. This in turn makes it possible to shorten the ductwork runs for savings that, when added to the reduced cost of a smaller furnace, come close to hitting the break-even target.

This is a more involved strategy, however, because consolidating the ductwork in the middle of the plan often requires changes in framing, or even a new floor plan. CARB has used this approach only in entirely new designs, such as that for the NVR/Ryan Home Carborne prototype in Rochester, New York (see "Production Home Sets New Standard," *HE* Sept/Oct '98, p. 5) and for a series of new designs currently in the works.

Keeping the ductwork inside the conditioned space is an important strategy that CARB explores in every prototype. The consortium carefully studied and then discarded the idea of insulating at roof level, due to the higher labor cost associated with working at roof level, the need to support the insulation between trusses, and the cost of installing insulation over a 25% greater area. CARB continues to experiment with duct runs in dropped ceilings, which requires settling on an A/C duct layout and coordinating it with the floor plan early on.

For relatively dry climates, CARB has found that ductwork can stay in the attic with little energy loss, provided that it is fully covered by the attic insulation and that care is exercised in duct sealing. In other cases, CARB has been able to move most of the ductwork from the attic into the interior walls and the joist space between the first and second floors in some two-story homes built in cooling climates. CARB is working with its Florida builders to devise cost-effective solutions to this problem in low-cost one-story homes.

To help its builder team members evaluate new technologies, CARB incorporates many innovations beyond what is included in these two basic packages. Builders serving energy-savvy markets, such as McStain Enterprises in Boulder, Colorado (see article in the News & Reviews section, p. 46), are more likely to adopt advanced technologies that raise the home's first cost to satisfy consumer demand for better home performance. Such technologies include structural insulated panel (SIP) wall and roof construction, high-SEER air conditioning, high-efficiency furnaces and water heaters, advanced control systems, innovative ventilation systems, zoned air distribution, energy-saving appliances, orientation-specific glazing, and better return air transfer from bedroom suites. In addition, CARB works with its builders to cut lumber use in their homes, incorporate material and labor-saving systems and techniques, use green building products, recycle construction waste, and improve indoor air quality by using low-VOC products and in some cases installing whole-house ventilation systems.

Some of the changes the consortium promotes may not qualify as glamorous breakthroughs, but by cutting the energy bills in thousands of homes, the savings mount up fast. And once builders realize that lower energy bills are almost always accompanied by improved comfort, they begin to get religion. CARB and the other Building America teams are working to prepare the market for a time when mainstream builders look to energy savings as a way to sell homes more effectively. If we have our way, that time may be sooner than you think.

—Gordon Tully

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The Building America program is dedicated to saving energy by working with builders to help them improve both their product line and their bottom line, through close collaboration and technology transfer (see "Builders Find New Technologies Paying Off," Jan/Feb '99, p. 18). This cost-shared partnership is managed by the U.S. Department of Energy, with technical support from the National Renewable Energy Laboratory.